# ROYAL ASTRONOMICAL SOCIETY.

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MANUEL J. JOHNSON, Esq., President, in the Chair.

Thomas Lee, Esq., Kilmarnock;
Rev. Bartholomew Price, Pembroke College, Oxford; and
George Rennie, Esq., 21 Whitehall Place;

were balloted for and duly elected Fellows of the Society.

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## *New Planet.*

A new planet was discovered on the 28th of May, by Mr. Norman Pogson, First Assistant at the Radcliffe Observatory, Oxford.

It was first seen on the 23d of May; but clouds prevented any further observation than a mere estimate of its place, which was then

| | | R.A. | N.P.D. |
|---|---|---|---|
| | h m | h m s | ° ′ |
| May 23 | 12 30 | 16 13 6 | 105 23 |

It is rather brighter than a tenth magnitude. The President having been invited to assign a name to the planet, has proposed to call it *Isis*.

Observations of the planet made by Mr. Pogson on the evening of its discovery, and subsequently to that date, will be found at page 200.

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## *Occultations* observed by Lieut. Joseph Dayman, R.N.

(*Extract of a Letter to the President.*)

"The papers of the Royal Astronomical Society are sometimes sent to me by the Hydrographic Office at the Admiralty, and in that for April this year I see some occultations observed by Capt. Shadwell at Portsmouth.

"Having made a few observations of the same kind on the coast of South Africa, for the determination of longitudes, which have been calculated at the Royal Observatory at Greenwich, I

send them in the hope that they may be made useful through the same channel, if you should think them worthy of publication:—

| Station of Observation. | Phenomenon Observed. | Day of Obs. | Observed Time of Station. | Resulting Long. East of Greenwich. | Latitude of Obs. Station. |
|---|---|---|---|---|---|
| | | 1854 | h m s | h m s | ° ′ ″ |
| D'Urban, Port Natal | Imm. of $\theta$ Ophiuchi | Aug. 4 | 9 16 18 | 2 4 16·9 | 29 52 48 S. |
| —— | Em. of $\theta$ Ophiuchi | ... | 10 35 25 | 2 4 10·8 | |
| | | 1855 | | | |
| Port Elizabeth, Algoa Bay | Imm. of $\delta$ Libræ | April 4 | 13 16 11·4 | 1 42 18·6 | 33 57 36 S. |
| —— | Imm. of $\alpha^2$ Libræ | April 4 | 13 25 44·4 | 1 42 21·4 | |
| —— | Imm. of $\varphi$ Sagittarii | April 8 | 14 34 28 | 1 42 21·9 | |

"The solar eclipse of November 20th, 1854, was also observed, but has not been calculated yet: the mean time of each contact was,—

| Station of Observation. | Phenomenon Observed. | Day of Obs. | Observed Time of Station. | Latitude of Obs. Station. |
|---|---|---|---|---|
| | | 1854 | h m s | ° ′ ″ |
| Port Elizabeth, Algoa Bay | Beginning | Nov. 19 | 22 24 57 | 33 57 36 S. |
| —— | Ending | Nov. 20 | 0 57 16 | |

"All these observations were made with a refracting telescope by Fraunhofer.

"2 *Adelaide Street, Charing Cross*, 1856, *June* 17."

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*Results derived from an Examination of certain places of the five principal Planets, as interpreted from Inscriptions on four old Tablets discovered in Egypt, made principally for Determination of the Epoch of the Tablets.* By Mr. William Ellis, Assistant at the Royal Observatory, Greenwich.

(*Communicated by G. B. Airy, Esq., Astronomer Royal.*)

The tablets considered in this paper were discovered with other antiquities by the Rev. Henry Stobart during travels in Egypt in the years 1853 and 1854. The whole of these antiquities appear to have been afterwards submitted to the inspection of M. Brugsch, of Berlin, who seems to have soon discovered that the inscriptions on four small tablets, forming part of the collection, consisted of a long series of places of the five principal planets. The result of M. Brugsch's examination of these tablets is to be found in a pamphlet published at Berlin about the end of the year 1855, under the following title:—*Nouvelle Recherches sur la Division de l'Année des Anciens Egyptiens, suivie d'un Mémoire sur des Observations Planétaires, consignées dans quatre Tablettes Egyptiennes en écriture démotique.* M. Brugsch gives in this pamphlet a description of the appearance of the four tablets, accompanied by engraved copies of the same, and also his rendering of the Egyptian inscriptions, the epoch of them, however, being unknown.

The following extract from the pamphlet will give some idea of the tablets :—

"I discovered in this collection four tablets of wood. . . . . These tablets, the edges of which are raised a little above the rest of the surface, exhibit on both sides a great number of demotic inscriptions, written upon a coating of plaster, some in columns of black ink, and others in columns of red ink, in a state of good preservation, with the exception of some parts where the plaster has been detached, or where it has been concealed by a greyish brown crust. One of the sides of each of these four tablets is pierced with two holes in three different places, a circumstance which leads one to suppose that they were originally bound together, so as to form a sort of book.

"Upon the first inspection which I made of these inscriptions in presence of M. Henry Stobart, I at once ascertained that they contain a very rich series of astronomical observations relative to five stars."

M. Brugsch was led to conclude from an examination of these inscriptions,—

1. That the eight pages of the four tablets relate to astronomical observations made in the years 8–19 of the reign of an Egyptian king, and of the year 1–17 of his successor. 2. That these astronomical observations relate to the five planets. 3. That the large number of demotic figures which follow the name of each planet represent two series, of which the first does not exceed twelve, and the second is not greater than thirty. The conclusion that the first series serves to indicate the twelve months of the Egyptian year ; and the second, one of the thirty days of each month, is justified by the circumstance that in some instances we find, in the second series, the sign *o* (expressing in demotics the word *day*) followed by one of the numerical signs serving to designate the days of the month. 4. That the five epagomene days are there mentioned for the first time in demotic writing, and are employed for the first time in fixing dates in general. 5. That the series of dates of the days of the month placed under the name of each planet would appear to indicate the day of the planet's entrance into one of the signs of the zodiac, or its retrogradation out of the sign.

It should be mentioned that after the figures representing the month and the day, there follows a character indicating the particular sign of the zodiac. M. Brugsch gives his rendering of the complete series of planetary places, which extend over a period of 29 years. The order in which the planets appear in each year is as follows :—*Saturn*, *Jupiter*, *Mars*, *Venus*, *Mercury*. There are, however, many gaps in the places during the later years, arising from causes already mentioned. After a discussion relating to the Egyptian names for the five principal planets, M. Brugsch says :—

"I have confined myself to establishing as rigorously as possible the Egyptian names by which the planets were designated,

It now remains to ascertain by calculation the epoch at which the observations consigned in these tablets were executed."

M. Brugsch concludes from the words "the year of the great house," which he met with in the course of his researches (an expression very frequently employed to designate the Roman emperors), that the tablets were written during the time of a Roman emperor. He remarks that the style of writing also applies very well to that epoch. The year 1 he accordingly concludes to be the first of the reign of an emperor. The year 19, which precedes, ought very naturally to designate the last year of the reign of his predecessor. This indicates the two reigns of Trajan and Hadrian, the former of whom reigned from 97 A.D. to 116 A.D., that is to say 19 years.

The following extract from the inscriptions on Tablet I., as interpreted by M. Brugsch, will serve as a specimen of the whole. The two sets of numbers in each column signify respectively the months and days according to the Egyptian calendar.

| Name of Planet. | Years. | | | | | | |
|---|---|---|---|---|---|---|---|
| | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| Saturn | 1 1 ♐ | 1 1 ♑ | 1 1 ♒ | 1 1 ♓ | 1 1 ♓ | 1 1 ♓ | 1 ♓ |
| — | 3 5 ♑ | ... | 5 14 ♓ | ... | 7 24 ♓ | 3 24 ♓ | 4 ♈ |
| Jupiter | 1 1 ♌ | 1 1 ♍ | 1 22 ♎ | 1 1 ♎ | 1 1 ♍ | 1 1 ♐ | 1 ♑ |
| — | 12 28 ♍ | ... | ... | 2 21 ♍ | 3 18 ♐ | 4 5 ♑ | 18 ♓ |
| — | ... | ... | ... | ... | ... | 8 15 ♓ | 5 ♓ |
| — | ... | ... | ... | ... | ... | 10 26 ♑ | |
| Mars | 1 16 ♐ | 1 1 ♌ | 1 1 ♐ | 1 17 ♍ | 1 5 ♓ | 1 1 ♍ | 1 1 ♈ |
| — | 2 27 ♑ | 2 11 ♍ | 2 5 ♑ | 3 5 ♎ | 3 19 ♓ | 2 13 ♎ | 5 25 ♉ |
| — | 4 5 ♓ | 3 29 ♎ | 3 13 ♓ | 4 23 ♍ | 5 2 ♈ | 4 1 ♍ | 7 11 ♊ |
| — | 5 13 ♓ | 5 27 ♍ | 4 21 ♓ | 6 7 ♐ | 6 15 ♉ | 5 13 | 8 27 ♋ |
| — | 6 23 ♈ | 12 28 ♐ | 6 2 ♈ | 7 29 ♑ | 8 3 ♊ | 6 21 * | 10 21 ♌ |
| — | 8 3 ♉ | ... | 7 13 ♉ | 9 23 ♓ | 9 21 ♋ | 8 3 | 12 15 ♍ |
| — | 9 19 ♊ | ... | 8 29 ♊ | ... | 11 14 ♌ | 9 0 | |
| — | 11 1 ♋ | ... | 10 13 ♋ | ... | Epag. 3 ♍ | 11 6 | |
| — | 12 22 ♌ | ... | 12 1 ♌ | | | | |

* or 25.

In the autumn of the year 1855, a manuscript copy of M. Brugsch's interpretation of the inscriptions on three of the eight sides of those Egyptian tablets was sent to the Astronomer Royal, who expressed a desire to have an examination made of the series of planetary places therein contained. The author accordingly obtained some results from them, which having come under the

notice of M. Biot, that distinguished philosopher kindly furnished him with a copy of M. Brugsch's pamphlet, in consequence of which he was enabled to examine the whole series of planetary places.

In order to discover, if possible, the probable positions of the planets in the different signs on the Egyptian days named; whether entering the signs, or whether in any other particular parts of the signs; the Egyptian places of *Mercury* and *Venus* for several instances of inferior conjunction where retrograde motion appeared to be shown, were laid down in curves, together with the curves described by those planets at some inferior conjunctions in recent times, for comparison; and it was found that the retrogradation at inferior conjunction could only be properly represented, on the supposition that the Egyptian times referred to the time of entry of the different planets into the various signs, at the commencement of the sign when moving direct, and at the termination of the sign when moving retrograde. On any other supposition the places could not be made properly to correspond. It was, therefore, assumed, that in all cases the Egyptian times referred to the time of entry of the planets into the respective signs; at the commencement or termination of the sign according to the motion of the planet at the time.

For determination of the epoch of the planetary places, the following was the course pursued:—An examination of the places of the quick-moving planets, *Mercury* and *Venus*, showed, that at the beginnings of the Egyptian years these planets were generally in or near to the signs ♌, ♍, or ♎; as if the year commenced near to the autumnal equinox: a more attentive examination showed that at the commencement of the year the Sun must have been near the beginning of the sign ♍. For finding the epoch by trial, it was therefore assumed that the first month of the Egyptian year corresponded to the month of September, Julian reckoning; which assumption proved to be very nearly true. Then, on the supposition that the vague Egyptian year, consisting of 365 days, was used, the places would refer either to some time near to 1500 B.C., or to about 30 B.C. But supposing the fixed year to have been used, the places might refer to any time later than the time of the alterations of the Egyptian calendar made about 25 or 30 B.C. Therefore, admitting both suppositions, the places are confined either to about 1500 B.C., or to some time later than about 30 B.C. M. Brugsch's conjecture that the end of the first series of planetary places corresponds to the end of the reign of the Emperor Trajan, points to the latter period as the more probable one; independently of which, the former is so remote as to render it on that account alone less probable. Moreover, the zodiac was most probably not known in Egypt at so early a period. The later time was, therefore, first examined. The epoch was definitely fixed by means of the places of *Jupiter* and *Saturn*, in connexion with the places of *Mars*. The Egyptian places seem to show that at some time,—certainly in year 17, in the first series,—there was a conjunction

in geocentric longitude of the planets *Jupiter* and *Saturn* in the sign ♈. But the geocentric longitudes of these planets never differ very greatly from the heliocentric longitudes. And as heliocentric conjunctions of *Jupiter* and *Saturn* occur at intervals of 20 years; each third conjunction, or those 60 years apart, taking place at an advance on the preceding one of 8° of longitude on the average, the intermediate conjunctions occurring at points 123° distant; it follows that in any particular sign of the zodiac, a series consisting of several conjunctions will take place at intervals of 60 years; after which no conjunctions will again happen in that particular sign for a space of about 700 years. On calculating, it was found that at about the commencement of the present era there were conjunctions of *Jupiter* and *Saturn* taking place in or near the sign ♈. Consequently if one of the conjunctions occurring near this time be not the one of year 17, it will be necessary to go backward or forward about 700 years, before conjunctions are found again to take place in ♈.

The approximate times of six successive heliocentric conjunctions near to the sign ♈ at the commencement of the present era, were in consequence calculated for trial, so as to include all geocentric conjunctions taking place in the sign ♈, with some which would occur in the signs ♓ and ♉. For each of these times the geocentric longitude of *Mars* was also calculated. Then assuming each conjunction in succession to have been that of year 17, the calculated places of *Mars* were compared with the corresponding Egyptian places in year 17, on the supposition that the Egyptian year commenced on September 1; comparing, however, those two instances so near the end of the Egyptian year with the places also from year 16. The results of the comparisons for the year 16 were found to be incongruous; those for the year 17 are contained in the following table:—

| Approximate Longitude of Heliocentric Conjunction of Jupiter and Saturn. | Approximate Julian Time of Heliocentric Conjunction of Jupiter and Saturn. | Corresponding Egyptian Month and Day assuming 1st Month, 1st Day = Sept. 1. | Approx. Egyptian Longitude of Mars for preceding Egyptian Time from Year 17. | Cal. Geoc. Long. of Mars for Conjunc. of Jupiter and Saturn. | Difference between Egyptian Long. and Cal. Long for Year 17. |
|---|---|---|---|---|---|
| ° | | | ° | ° | ° |
| 348 | −6 Aug. 26 | 12th Month, 30th Day | 173 | 217 | 44 |
| 357 | 54 Mar. 20 | 7th — 21st — | 84 | 106 | 22 |
| 7 | 113 Oct. 22 | 2d — 22d — | 69 | 67 | 2 |
| 18 | 173 May 9 | 10th — 1st — | 116 | 322 | 154 |
| 28 | 233 Jan. 6 | 5th — 8th — | 56 | 201 | 145 |
| 39 | 292 Aug. 22 | 12th — 27th — | 172 | 101 | 71 |

In consequence of the very near agreement of the longitudes in the third instance, the place of *Venus* was calculated for 113 October 22; and the place of *Mercury* for 113, November 13; and compared with the corresponding places in year 17, supposing first month, first day = 113, September 1. The calculated geocentric longitude of *Venus* was found to be 195°, and that of *Mer-*

*cury* 221°. The Egyptian places of *Venus* for 2d month 22d day, and of *Mercury* for 3d month 14th day, the times corresponding, were found to be 195° and 210° respectively; the difference for *Venus* being = 0°; and that for *Mercury* = 11°. Thus the places of all the planets agree within comparatively small limits on the supposition that year 17 of the tablets corresponds to 113 A.D., the difference for *Mercury* amounting only to a few days' motion. For each of the other conjunctions the place of *Mars* alone is discordant. It was consequently assumed that

| | Egyptian. | Julian. |
|---|---|---|
| Series I. | Year 17, 1st Month | = 113 September |

and this makes the end of the first series of Egyptian years correspond to the end of the reign of the Emperor Trajan, as was conjectured by M. Brugsch. The preceding examination shows the certainty with which the identification would have been made in the absence of any conjecture as to the probable epoch; and also how the places could be proved to correspond to no other epoch.

Having found the epoch of the planet places, the approximate commencement of the year, and also that the Egyptian times referred to the time of the different planets entering the zodiacal signs, a more accurate determination of the Julian commencement of the Egyptian year was attempted as follows. The Julian times of entry of the planets *Mercury* and *Venus*, into various signs, were found by calculation to the nearest civil day, taking that day on which the entry occurred nearest to noon, for several instances in every year, excepting those contained on Tablet III. The times taken were when the planets were moving direct and with tolerable rapidity, no other particular selection being made. Then by counting back the number of days elapsed from the beginning of the Egyptian year to the Egyptian time corresponding, the Julian time of commencement of the Egyptian year was inferred, as in the following instance in year 10 of the first series, for *Venus*.

| Egyptian Date and Sign. | Calculated Julian Time of Entry of ♒ corresponding. | Inferred Julian Time of Commencement of Year 10. |
|---|---|---|
| Year 10, $7^{m}$ $1^{d}$ ♒ | 107, February 26 | 106, August 30 |

The mean date of the commencement of the Egyptian year found in this way from a great many places of *Venus* was:—

August $31^{d}\cdot4$

The places of *Mercury* treated in a similar way gave for the date of commencement of the year.

August $28^{d}\cdot2$

The result found from the places of *Mercury* thus differs by several days from that found from the places of *Venus*. *A consideration, however, of the results as given by each planet

separately, shows that the Egyptian year here used was evidently of equal length with the Julian year. It was, probably, the fixed Alexandrian calendar, as described in M. Biot's *Résumé de Chronologie Astronomique*, Vol. XXII. of the *Mémoires de l'Académie des Sciences*, in which the year commenced on August 29 Julian. The mean of the places of *Venus* and *Mercury*, August $29^{d}\cdot8$, very nearly agrees with this date.

The author next proceeds to ascertain the date of the commencement of the year from the inferior conjunctions of *Mercury* and *Venus*, and from the recorded entrance of the superior planets into the various signs of the zodiac. The results are pretty accordant, and serve to confirm the conclusion at which the author had already arrived in reference to this point.

With respect to the question whether the Egyptian places are the results of observation or of calculation, the author has the following remarks :—

"As to the probability of the Egyptian places having been the result of actual observation, an examination of the places themselves seems to show that they do not possess the character of observations; the places of *Mars* being continuously given at each time of conjunction with the sun, when the planet for some time could not have been visible : those of *Jupiter* and *Saturn* are also occasionally given very near to the time of conjunction ; and those of *Mercury* and *Venus* appear to form nearly unbroken series, excepting that the instances of retrogradation of *Mercury* at inferior conjunction do not form an average, even when a deduction is made for those cases in which the retrogradation would be confined to the limits of one sign : in the case of *Venus*, however, there is quite an average number of retrogradations noticed. The curious discordances on Tablet III.* would also appear to show that the places are not the result of observation. They seem, indeed, to form a kind of planetary ephemeris, in which are given the successive times of entrance of the five planets into the 12 signs of the zodiac, as found by calculation, or by some equivalent method."

The author thus sums up the results which he considers to be derivable from the preceding examination :—

"1. That the dates attached to the different signs of the zodiac denote the times at which the planets entered those signs, according to the Egyptian calendar ; either with direct motion at the commencement of the sign, or with retrograde motion at the termination of the sign, as the case may be ; excepting those instances in which the positions of the planets are given on the first day of the Egyptian year, in which cases the proper signification is merely, that at the beginning of the Egyptian year the planets were within the limits of the sign named, and not at the entrance of the sign : also, that as far as can be ascertained the position of the Egyptian equinox was correct.

* The author gives a detailed account of these discordances in a preceding section of his paper.

"2. That the first day of the Egyptian year corresponded, throughout the series, either to about August 29, or August 30, of the Julian calendar, but with an uncertainty as respects the exact day; the Egyptian calendar, however, being probably identical with the fixed Alexandrian calendar.

"3. That year 9 of the first series commenced in August, 105, A.D., making the first series of Egyptian years correspond to the termination of the reign of the emperor Trajan, as was conjectured by M. Brugsch. Consequently:—

| | Egyptian. | | | Julian. | |
|---|---|---|---|---|---|
| Series I. | Year 9 | 1st month, 1st day | = A.D. 105 | August 29 or 30 | |
| — | — 19 | — — | = 115 | — | — |
| Series II. | Year 1 | — — | = 116 | — | — |
| — | — 17 | — — | = 132 | — | — |

"4. That the Egyptian places are either calculated places, or places found by some equivalent method; and are not the result of actual observation.

"With respect to the accuracy of the places calculated for comparison with the Egyptian places, it may be mentioned that in calculating the heliocentric longitudes, the equation of the centre was always applied: for *Jupiter* and *Saturn* the great equation was also applied: no others were taken into account. In finding the geocentric longitudes, the true radius vector was always used, excepting for some of the places of *Venus* first calculated, for which the mean distances of the Earth and *Venus* were used."

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*Occultation of Antares.* Observed by Capt. Shadwell, R.N.

| | Portsmouth M.T. h m s |
|---|---|
| Disappearance (dark limb) | 11 23 24·2 |
| Reappearance (bright limb) | 12 41 29·4 |

"At the disappearance the weather was quite clear, and the phenomenon was instantaneous.

"At the reappearance a slight haze was passing over the moon, but the time is probably true within a second.

"*R. N. College, Portsmouth, June 16th*, 1856."

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*Occultation of Antares, June 16th*, 1856.
Observed by T. W. Burr, Esq.

"Notwithstanding that the night was generally unfavourable for observation—the sky being mostly covered with hazy clouds

—a small space round the moon became clear prior to the occultation, which was therefore very well seen.

| | Sidereal Time. h m s |
|---|---|
| The immersion took place at the dark limb at | 17 10 2 |
| The reappearance at the light limb at ... ... | 18 27 44 |

"The immersion was perfectly instantaneous.

"In consequence of the strong light of the moon, which was nearly full, and the emersion taking place at the bright limb, I had no chance of perceiving the small star with the telescope employed, my equatoreal of 4 feet focal length and $3\frac{3}{8}$ inches aperture. The power used was 173. Longitude $23^{s}\cdot8$ W.

"*Highbury, 8th July*, 1856."

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*Observations of the New Planet Isis, made with the Ten-feet Equatoreal and Ring Micrometer, at the Radcliffe Observatory, Oxford.* By Mr. Norman Pogson.

(*Communicated by the President.*)

| Greenwich M.T. | App. R.A. | App. N.P.D. | Logarithm of Par. Corr. × Δ. R.A. | N.P.D. | Star of Comp. |
|---|---|---|---|---|---|
| h m s | h m s | ° ′ ″ | | | |
| May 28 12 33 44 | 16 7 36·07 | ... | +8·884 | ... | *a* |
| 13 3 0 | 16 7 34·73 | 105 30 50·7 | 9·084 | −0·893 | *a* |
| 13 37 19 | 16 7 33·14 | 105 30 54·7 | 9·238 | ·788 | *a* |
| June 1 11 26 47 | 16 3 16·07 | 105 39 19·0 | 7·206 | ·898 | *b* |
| 11 26 47 | 16 3 16·39 | 105 39 19·1 | 7·206 | ·898 | *c* |
| 2 13 1 36 | 16 2 7·68 | 105 41 48·2 | 9·197 | ·890 | *c* |
| 3 13 44 25 | 16 1 1·93 | 105 44 14·8 | 9·349 | ·881 | *c* |
| 6 12 23 59 | 15 57 57·87 | 105 51 41·5 | 9·080 | ·895 | *c* |
| 9 13 29 57 | 15 54 54·96 | 106 0 10·7 | 9·384 | ·879 | *d* |
| 13 46 3 | 15 54 54·46 | 106 0 13·8 | 9·417 | ·874 | *d* |
| 10 12 8 7 | 15 54 0·38 | 106 2 59·0 | +9·136 | −0·893 | *d* |

All the observations have been duly corrected for refraction and motion. The adopted places of the comparison stars, for the epoch 1856·0, were as follows:—

| | Mag. | R.A. h m s | N.P.D. ° ′ ″ |
|---|---|---|---|
| *a* = A.Z. 297.78 = 29610 Lal. ... ... ... | 8 | 16 7 42·92 | 105 31 11·7 |
| *b* = A.Z. 205.73 ... ... ... ... ... ... | 9 | 16 4 39·43 | 105 38 28·8 |
| *c* = A.Z. 205.70 = A.Z. 297.70 ... ... ... | $9\frac{1}{2}$ | 16 0 31·22 | 105 42 19·8 |
| *d* = A.Z. 205.66 = A.Z. 297.65 = 29175 Lal. | $8\frac{1}{2}$ | 15 55 22·60 | 105 59 55·4 |

Argelander's positions have been allowed double weight to those of Lalande. The right ascension of star *d* is one minute too small in Argelander's Zone 297.*

* With the exception of *Flora*, *Isis* is the nearest to the sun, and has, therefore, the shortest periods of the known asteroids.

On June 3 *Isis* passed exactly over a star of the 10th magnitude, at $13^h\ 16^m$ Mean Time. The night being hazy and definition consequently very bad at so low an altitude, a power of 65 was preferred, though much too small for such an observation.

At $13^h\ 12^m\ 20^s$ G.M.T. *Isis* was so close to the star as to be inseparable, though decidedly elongated.

At $13^h\ 16^m\ 20^s$, the two objects appeared as one sharp round star.

At $13^h\ 19^m\ 20^s$, they again began to look elongated.

At $13^h\ 21^m\ 20^s$, the planet and star distinctly separated.

The mean of the first three times, viz. $13^h\ 16^m\ 0^s$, may be taken as the true time of occultation. If the planet had passed either above or below the star, instead of occulting it, a rapid twisting of the angle of position would have been evident. Nothing of the kind was, however, seen; and it may be safely assumed that a good meridian position of this star will fix the place of the planet at the above time with great accuracy. Its approximate mean place for 1856·0 is,—

R.A. $16^h\ 1^m\ 1^s$ N.P.D. 105° 44′

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*On the Variability of* 13 *Lyræ.* By Josh. Baxendell, Esq.

(*Communicated by Sir John Herschel.*)

"In December last I was led to suspect that 13 *Lyræ* was subject to a slight periodical change of brightness. A series of observations, which I have since made, has confirmed the suspicion, and given an approximate period of 48 days. The range of variation is about 3-10ths of a magnitude, the highest maximum which I have yet observed being 4·28, and the lowest minimum 4·60. The last minimum occurred on the 14th of June. Like many of the other variables, 13 *Lyræ* belongs to the list of ruddy stars.

"*Manchester, July 3d*, 1856."

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*On the Period and Changes of α Herculis.*
By Josh. Baxendell, Esq.

(*Communicated by Sir John Herschel.*)

The period in which *α Herculis* completes all its changes of brightness was supposed by Sir Wm. Herschel to be about $60\frac{1}{4}$ days. More recently M. Argelander has been led to conclude that it may be estimated at 66 days 8 hours. Some years ago I found that Sir Wm. Herschel's period would not satisfactorily represent a number of observations which I had occasionally made; but assuming it to be sufficiently near the truth to serve as an approximation, I obtained a mean period of 63 days. Although this period was decidedly preferable to one of $60\frac{1}{4}$ days, or indeed to any

other between the limits of 50 and 70 days, yet some anomalies still remained, which, from the desultory nature of the observations, I was unable to account for in a satisfactory manner. In order, therefore, to ascertain the cause of these anomalies, I have since made a more regular and more extensive series of observations; and have arrived at the very remarkable and unexpected result—that the periods assigned by Sir Wm. Herschel and M. Argelander are both considerably in error; and that, in fact, the actual mean period is about 88½ days. The observations which have led to this result extend over a period of nearly *eight* years, and have been made with every precaution to avoid the errors to which such observations are liable. The stars which have been used in the comparisons are:—

| | | |
|---|---|---|
| β Herculis ... ... ... | 3·14 | Magnitude. |
| ζ —— ... ... ... | 3·19 | — |
| β Ophiuchi ... ... ... | 3·26 | — |
| δ Herculis ... ... ... | 3·51 | — |
| ε Ophiuchi ... ... ... | 3·58 | — |
| μ Herculis ... ... ... | 3·69 | — |
| ξ Herculis ... ... ... | 3·91 | — |

The comparisons have generally been made with at least two stars, and frequently with three or four; and as all the stars of comparison are not equally steady in brightness, they have been frequently compared with each other and with other stars in the neighbourhood, and whenever any change has been observed, it has been taken into account in making the reductions.

The number of single periods which the observations have afforded is *twenty-four*—namely, *eleven* from maximum to maximum; and *thirteen* from minimum to minimum. The longest single period is 111 days, and the shortest 70 days; the mean of the whole being 86·79 days. This value has been used in determining the number of periods in the longer intervals; regard being had, however, at the same time, to the indications presented by such observations as may have been made during the intervals.

The following tables include all the maxima and minima, the middle times of which have been obtained with sufficient accuracy to be available for determining the value of the mean period:—

*Observed Maxima of α Herculis.*

| No. | Middle Times of Maximum Brightness. | Magnitude. | Intervals in Days. | Number of Periods in the Intervals. |
|---|---|---|---|---|
| | 1848. | | | |
| 1 | Nov. 13 | 3·26 | | |
| | 1849. | | | |
| 2 | March 4 | 3·28 | 111 | 1 |
| 3 | June 13 | 3·30 | 101 | 1 |
| 4 | Sept. 8 | 3·26 | 87 | 1 |
| | 1850. | | | |
| 5 | June 14 | 3·14 | 279 | 3 |
| 6 | Aug. 26 | 3·29 | 73 | 1 |

| No. | Middle Times of Maximum Brightness. | Magnitude. | Intervals in Days. | Number of Periods in the Intervals. |
|---|---|---|---|---|
| | 1851. | | | |
| 7 | March 6 | 3·56 | 192 | 2 |
| 8 | June 14 | 3·42 | 100 | 1 |
| 9 | Sept. 12 | 3·45 | 90 | 1 |
| | 1852. | | | |
| 10 | Aug. 15 | 3·47 | 338 | 4 |
| | 1853. | | | |
| 11 | July 30 | 3·30 | 349 | 4 |
| 12 | Oct. 25 | 3·32 | 87 | 1 |
| | 1854. | | | |
| 13 | April 20 | 3·14 | 177 | 2 |
| 14 | July 21 | 3·30 | 92 | 1 |
| 15 | Oct. 8 | 3·23 | 79 | 1 |
| | 1855. | | | |
| 16 | April 19 | 3·39 | 193 | 2 |
| 17 | June 29 | 3·32 | 71 | 1 |
| 18 | Dec. 25 | 3·30 | 179 | 2 |
| | 1856. | | | |
| 19 | Mar. 15 | 3·41 | 81 | 1 |

## *Observed Minima of α Herculis.*

| No. | Middle Times of Minimum Brightness. | Magnitude. | Intervals in Days. | Number of Periods in the Intervals. |
|---|---|---|---|---|
| | 1848. | | | |
| 1 | Sept. 22 | 3·77 | | |
| | 1849. | | | |
| 2 | April 26 | 3·69 | 216 | 2 |
| 3 | July 29 | 3·52 | 94 | 1 |
| 4 | Oct. 21 | 3·62 | 84 | 1 |
| | 1850. | | | |
| 5 | April 29 | 3·46 | 190 | 2 |
| 6 | July 14 | 3·42 | 76 | 1 |
| 7 | Oct. 10 | 3·58 | 88 | 1 |
| | 1851. | | | |
| 8 | April 20 | 3·87 | 192 | 2 |
| 9 | Aug. 2 | 3·69 | 104 | 1 |
| | 1852. | | | |
| 10 | April 21 | 3·69 | 263 | 3 |
| 11 | June 30 | 3·66 | 70 | 1 |
| 12 | Sept. 30 | 3·63 | 92 | 1 |
| | 1853. | | | |
| 13 | June 16 | 3·63 | 259 | 3 |
| 14 | Sept. 15 | 3·58 | 91 | 1 |
| | 1854. | | | |
| 15 | June 5 | 3·58 | 263 | 3 |
| 16 | Aug. 19 | 3·46 | 75 | 1 |
| | 1855. | | | |
| 17 | May 17 | 3·54 | 271 | 3 |
| 18 | Aug. 14 | 3·60 | 89 | 1 |
| 19 | Nov. 13 | 3·48 | 91 | 1 |
| | 1856. | | | |
| 20 | Feb. 8 | 3·56 | 87 | 1 |
| 21 | April 18 | 3·56 | 70 | 1 |

The data in these tables give the following results, the values of the mean period having been obtained by the method of least squares:—

| | |
|---|---|
| Mean period by table of maxima ... ... ... | = 88·63 days. |
| — — minima ... ... ... | = 88·47 |
| Mean | = 88·55 |
| Interval from minimum to maximum ... ... ... | = 45·24 |
| — maximum to minimum ... ... ... | = 43·31 |
| Sum = mean period | = 88·55 |
| Mean minimum magnitude ... ... ... ... ... | = 3·59 |
| — maximum — ... ... ... ... ... | = 3·32 |
| Mean range | = 0·27 |
| Least minimum magnitude ... ... ... ... ... | = 3·87 |
| Greatest maximum — ... ... ... ... ... | = 3·14 |
| Greatest range | = 0·73 |
| Mean range of variation in the length of the period | = 11·87 |
| Greatest range — — — | = 41·00 |

During the interval from September 1848 to August 1852, the variations in the length of the period were very remarkable, the extreme range amounting to 41 days, and the mean to 14·9 days; while in the interval from August 1852 to April 1856 the extreme range of variation was only 26·5 days, and the mean 7·8 days. The average length of a period was also greater in the former interval than in the latter, the difference being about $4\frac{1}{2}$ days.

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## *Note on the Telescopic Appearance of Mars.*

By Frederick Brodie, Esq.

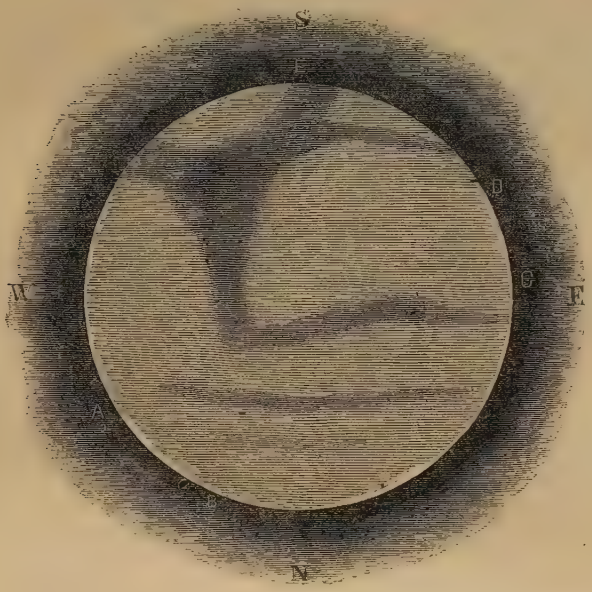
(*Extract of a Letter to Mr. De La Rue.*)

"I enclose you a rough sketch of *Mars*, as seen by me on April 18th. I find it rather difficult to give just the representation that I would wish, without giving considerable time to it, my hand has been so long out of water-colouring that I can only profess to give outline correctly. It seems that the date corresponds to your own observations nearly. The colour should be properly made of *brickdust*. I send you an extract from the observatory book concerning it.

"*The Gore, 16th June*, 1856.

"April 18th. Wind east. Atmosphere unsteady. $10^h\ 10^m$ Sidereal Time. Observed *Mars*, which is very near the moon

(13·3 days old). I never saw the planet to so much advantage. The Poles are brilliantly illuminated, especially the South Pole.




The dark part is of a dirty sea-green shade; the rest of the planet reddish, as usual. I saw the planet well with powers 396 and 578; object-glass 6¼ inches aperture. On further examination I see that the greater part of the periphery of the planet is illuminated, though not so bright as the illumination at the Poles, more especially from A to B and C to D, but all round from E to A B C D, ending at D, is very much brighter and whiter in colour than the rest of the planet. It now became cloudy."

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The Fellows of the Society will be glad to learn that Lady Bellew has presented to the Society, through Sir John Macneill, a copy of the celebrated Tables of her father, Mendoza Rios, the eminent Nautical Astronomer, containing numerous autograph corrections by the author. Mendoza Rios, as is well known, was originally an officer in the Spanish service, but his attachment to England induced him to quit Spain and adopt this country as his future place of abode. It has been asserted that this excellent astronomer had a pension from the English Government, but there is reason to believe that this statement is not correct.

Allusion was made in the last *Monthly Notices* to an expedition which Government contemplated despatching to the Island of Teneriffe. Professor Smyth, to whom the charge of the expedition was confided, has since proceeded to his destination. The readers of the *Monthly Notices* will be gratified to learn that he was furnished with the means of transport thither by Robert Stephenson, Esq. the eminent engineer, who munificently placed his private yacht Titania at the disposal of Professor Smyth.

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The Royal Academy of Sciences of Göttingen has presented to the Society two impressions of a medal struck in honour of the illustrious Gauss, one in silver and the other in bronze. This interesting memorial is $2\frac{3}{4}$ inches in diameter. On the obverse is seen the head of Gauss, with the inscription:

CAROLVS FRIDERICVS GAVSS

NAT. MDCCLXXVII. APR. XXX. OB. MDCCCLV. FEB. XXIII.

Upon the reverse is a wreath of ivy, within which are to be read the words:

GEORGIVS V. REX HANNOVERAE,

MATHEMATICORVM PRINCIPI.

Around the wreath we read:

ACADEMIAE SVAE GEORGIAE AVGVSTAE DECORI AETERNO.

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*Suggestions respecting a Method for determining the Brightness of the Minor Planets.* By Professor Argelander.*

The author commences this Paper with some preliminary remarks on the importance of observations of the brightness of the minor planets. It is plain that researches of this nature, if planned with intelligence and prosecuted with zeal for a considerable length of time, might lead to various important conclusions, not only with respect to those bodies themselves, but also relative to many other interesting questions of astronomy, —conclusions which are the more important the less reason we have to hope to arrive at them by any other means. The author, accordingly, proceeds to give a few hints relative to the most suitable mode of conducting observations of this kind. They are merely hints; but as they are founded upon long personal experience, they may not be without some use. Moreover, an expert observer will have no difficulty in applying to them various

* *Ast. Nach.* No. 996.

modifications, which may adapt them more effectually to the object he has especially in view.

The points which the author considers to be mainly worthy of attention in observations of this kind are the following:

1. Since we have reason to suppose that all the small planets revolving between *Mars* and *Jupiter* have had a common origin, and have passed through the same stages of physical organization, we may conclude that they are all characterised by the same, or at least *nearly* the same, natural colour of surface. Hence the determination of their relative brightness would serve to indicate their relative magnitudes; and consequently, we might arrive at a knowledge of their absolute magnitudes, if we should once be in a position to determine the apparent diameter of one of them. It is not improbable that, in the course of time, we may be enabled to accomplish this object. No reliance can be placed upon any results of this nature which have been hitherto obtained by observers; or, at all events, they can only be considered as affording, in each instance, a superior limit of the true measure. It cannot be doubted, however, that the immense telescopes, which are now directed towards the heavens in different parts of the world, will enable the observer, under favourable circumstances, to arrive at trustworthy results in relation to this object. Hence the determination of the *mean brightness*, and the comparison of the values of that element for the different planets, must form one of the principal objects of research.

2. It is well known that observers have suspected variations in the brightness of several of the minor planets, which seemed to indicate a rotation on an axis. The author himself had announced an observation of this kind, which appeared in No. 325 of the *Astronomische Nachrichten*. Such a conclusion, however, is very doubtful, the influence of atmospheric circumstances being very deceptive. The atmosphere, especially in our latitudes, is scarcely ever free from vapours. Even during apparently the most serene sky the heavens are here and there disturbed by very minute vapours, the presence of which is recognised by the fact that very faint stars suddenly vanish altogether, and soon reappear; while others in their vicinity, which were easily perceived, now cease to be visible. It is manifest that such disturbing causes must exercise an influence upon the brightness of stars which do not vanish altogether. In observations with illuminated fields of view, we have to encounter another difficulty arising from the circumstance of the illumination being not always the same. This must be adapted to the brightness of the object to be observed. The degree of faintness of the field affords now, indeed, an estimate of the brightness of the star, but a very imperfect one, since the eye very soon accustoms itself to a faint illumination, and imagines it to be more intense than it really is. It is only by direct and repeated comparisons of two stars that we can hope to arrive at anything approaching to trustworthy results. In this way, however, we may succeed in de-

tecting real variations of light in the small planets. Should these arise from the existence of irregularities on the surfaces of the planets combined with a movement of rotation, they ought, as a necessary consequence, to return at regular intervals of time. It is possible, however, that they may be due to other causes. It seems, indeed, very probable, that the space between the planets of our system is not absolutely empty, but is pervaded more or less by a fluid substance, or by small bodies. If the orbit of *Mars* was encompassed by a system of aerolites similar to those which we perceive in the neighbourhood of the terrestrial orbit, or if such a system of aerolites revolved in the interval between *Mars* and the small planets, the light of the latter might undergo a sensible diminution, and we should thereby be enabled to detect the existence of the revolving bodies. Variations of light of this kind, as well as possible fluctuations in the atmospheres of the small planets, would be distinguished by an absence of periodicity from those which would be disclosed by a movement of rotation. In order to detect such variations, it would be necessary to institute comparisons at different times, partly in close succession, partly at wider intervals of time apart.

3. Our knowledge of the relative brightness of the stars in the different classes of magnitudes is still very imperfect. We know only very superficially how the different classes of magnitudes, according to which we are accustomed to arrange the stars, are related to the quantities of light which they transmit to the eye. The photometric determinations hitherto executed in reference to this object deviate so considerably from each other that they can only be regarded as rough approximations. This arises partly from the imperfect means which we possess for measuring light, especially when the question relates to faint stars, and partly from the difficulty of employing those means in the execution of large masses of observations, whereby the fluctuations in the condition of the atmosphere might be eliminated. To this we must add the different impression which differently coloured light produces upon the eye, the influence exercised by circumstances depending on the peculiar constitution of the observer's eye, and by the particular kind of telescope employed in the observations. Red light, for example, makes a considerably fainter impression upon the eye of a short-sighted than upon that of a long-sighted person; also in small telescopes the impression produced is fainter than in more powerful instruments. Now, the proposed method of observation must solve all these ambiguities. If we compare the small planets in every possible variety of distance from the sun and earth with a series of well-chosen fixed stars, and if we hence calculate according to photometric principles the quantities of light which we receive from the planets at the individual distances, we shall thereby become acquainted with the relations between the different magnitudes, at least up to the sixth magnitude (through *Vesta*), and thus a scale might be constructed which would serve as a guide to observers in the estimation of magnitudes. From such

materials there might be deduced much more trustworthy conclusions than have been hitherto arrived at respecting the general distribution of the stars according to their different distances and the arrangement of the stars in the system constituting the milky way. By means of observations of this kind the question might also be decided whether the celestial regions beyond our solar system are pervaded by a substance of unequal density, since the occasional interposition of the more compressed parts of such a medium, arising from the movement of the solar system in space, would cause the stars to assume a fainter appearance. Olbers, and in more recent times Sir John Herschel, have shown that such an hypothesis is by no means improbable, and would afford an easy explanation of many facts which have been established with a greater or less degree of certainty.

4. Imperfect as is our knowledge of the absolute brightness of the stars, the information which we possess respecting their relative brightness at different altitudes above the horizon is equally unsatisfactory. The law according to which our atmosphere absorbs the light of the stars at different altitudes has repeatedly formed the object of research since the times of Bouguer and Lambert, but it appears that notwithstanding even the careful researches of Seidel the requisite degree of certainty has not been attained. This arises chiefly from the fluctuations of our atmosphere, the injurious effects of which can only be eliminated by means of a large mass of observations. This circumstance must therefore be taken into account in devising a proper method of observation.

In order, then, to attain these various ends in greatest perfection, and as free as possible from constant errors, the author suggests the following course of procedure :—

1. First, it will be necessary to select a series of fixed stars of different magnitudes, which may serve as points of reference for comparisons of brightness. Such stars can only be found in the region of the pole, where, in consequence of their almost uniform, and in our latitudes pretty considerable altitudes above the horizon, the brightness of the stars is not sensibly altered by the extinction of the rays of light in the course of their passage through the atmosphere. The region between $\delta$ *Ursæ Minoris* and 24 *Cephei* (Hev.) is well adapted for this purpose. The latter star, and consequently the entire region, is easily recognisable by means of four stars situate near it, and forming the figure of a rhomboid.* The region comprises stars of all degrees of brightness from the sixth to the tenth magnitude. Even fainter stars

* The positions of these stars for 1855 and their approximate magnitudes in integers and decimals are the following :—

| M | h m | o ′ | M | h m | o ′ |
|---|---|---|---|---|---|
| 8·3 | 20 17 | +88 33 | 9·3 | 20 30 | +88 47 |
| 9·0 | 20 24 | +88 26 | 8·5 | 20 55 | +88 41 |

will be found in abundance if the observer should desire to include such in his comparisons.

2. A number of these stars, including every shade of brightness, must now be carefully compared together, and their relative brightness determined by means of repeated observations. The author alludes to the method which has been employed for effecting this object by comparisons of equal brightness. He remarks that, according to his own experience, one may judge with equal precision respecting minute gradations of light, and that results equally worthy of confidence will be obtained if the observer should compare the star whose brightness is to be determined with two other stars, one of which is a little brighter, and the other a little fainter. He accordingly proposes the method which he employs in the observation of variable stars, and which has been found by several other observers to be a convenient one. Designating the faintest of the stars by 0, the next brighter by 1, 2, 3, &c., a scale of comparison will thereby be formed which will serve to ascertain the relative brightness of the small planets. By observing the planets at various distances from the sun and earth, materials will be obtained for comparing the luminous intensities of the stars of the scale with their estimated magnitudes.

3. It would not be advisable to compare the planet directly with the stars of the scale which approach it in brightness. Our knowledge of the light-absorbing power of the atmosphere at different altitudes is not only too uncertain, but the absorption varies too much with the time and the azimuth of the object to admit of this process. The observer, therefore, on every occasion, when he wishes to determine the brightness of a planet, selects two stars in its vicinity, one being a little brighter, and the other a little fainter than it. It is not necessary that these stars should be visible in the field of the telescope at the same time with the planet. It is even desirable to select them at some distance from the planet, preceding or following the latter, according as its motion is retrograde or direct, so as to be enabled to employ the same stars of comparison for several days. By this means the observer is enabled to recognise with greater facility the existence of slight periodic variations in the brightness of the planet, but the principal advantage which he derives from the process consists in the elimination of the effects of any irregularities in the condition of the atmosphere in the region of that planet and that of the scale. The stars which have been directly compared with the planet must now be compared with as many stars of the scale as possible, and it will be desirable to institute this latter comparison on the same nights that the comparisons of the planet have been made. It is only necessary to select such stars as form easily recognisable configurations, so that they may be found again without any difficulty. For this purpose it will be desirable that the observer should trace out upon a chart the course of the planet to be observed, and that he should make himself well acquainted

beforehand with the stars near which it passes. If, after the lapse of some time, the planet has removed too far from the first stars of comparison, or if its brightness has varied too considerably, the observer should then select new stars according to the same principles, comparing these not only with the stars of the scale, but also, if practicable, with the former stars of comparison, always endeavouring by a multiplication of comparisons to render the results more trustworthy. Should the planet after quitting a stationary point revisit the same region which it had previously traversed, the observer must then search for stars approaching it in brightness, and compare these, if necessary, by means of other stars of intermediate brightness, with the former stars of comparison. Moreover, should several small planets happen to be all at once in the same region of the heavens—a circumstance which frequently occurs,—and should they not differ too much in brightness, the observer ought not to omit carefully comparing them together as often as occasion offers.

4. In applying this method of observation the process of comparing with the scale will be found to be very difficult, indeed the certainty of the result will be very much endangered, if the observer should have at his disposal only one telescope, which he turns alternately upon the scale and the region of the planet. Even if he should have an assistant to attend to the adjusting of the instrument, and if the latter should be furnished with circles for this purpose, still it will be impossible to prevent extraneous light from entering the eye of the observer. In every case the time which elapses between the two corresponding observations will be too long for the impression which the brightness of the first star has left in the eye to remain undiminished until the observer is enabled to consider the second star. In order to obtain a result which shall be in any degree worthy of confidence, a great many comparisons must be instituted, and each observation must occupy a considerable interval of time. The observer must abandon the use of very large telescopes in researches of this kind, and must content himself with instrument of moderate power. Telescopes from the Munich workshops of 48, and even 42 lines aperture, will amply suffice for accurate comparisons of stars to the tenth magnitude. They possess at the same time the advantage of being applicable to observations of the brightest of the small planets in all stages of brightness, which is not the case with respect to large refractors. In these the stars of the sixth and seventh magnitudes, and even the brighter stars of the eighth magnitude, have so much light that it is impossible to estimate their brightness with any degree of certainty.

The observer must now direct one of the telescopes to the scale, and the other to the region of the planet. The two instruments must be placed so that the eye-pieces shall be near to each other, and the eye in a few seconds can pass from the one to the other. It is a matter of importance that both telescopes should have the

same optical power; but as this object cannot be rigorously accomplished, it will be desirable that the observer should direct each telescope alternately to the scale. When once the relative optical powers of the two telescopes have been thus ascertained, the observations may be henceforward prosecuted without having recourse to an interchange of instruments.

5. It is important that the observations should be prosecuted in the dark, and that no extraneous light should enter the eye until the observation is quite finished. The observer must, therefore, arrange beforehand, so as to be enabled to write in the dark without confusion. A framework or system of strips of black paste-board, laid upon paper, will here perform good service, since the strips of paste-board, which may be seen even in the darkest nights, will serve as lines for separating the individual observations from each other.

6. No observations should be made during the prevalence of a fog, even although it should appear to be uniformly distributed over the whole heavens. Nor should any be made during bright moonlight, especially if the moon should happen to be anywise near the planet which is being observed, since in that case the illumination of the ground of the heavens would be too unequal in the region of the planet and that of the scale. Still less should observations be made at altitudes lower than 10°. Near the horizon the vapours arising from the surface of the earth, as well as the radiation of heat from the latter, exercise too great or too fluctuating an influence, and render the extinction of light too uncertain, both absolutely and in different azimuths, to hold out any prospect of deducing trustworthy results from such observations, even although repeated many times. Even the observations comprised between 10° and 20° of altitude will for the most part serve merely for ascertaining the extinction of light, and only in exceptional cases and under especially favourable circumstances can they be employed for the ultimate object of the investigation.

7. It will be desirable to observe only such planets as, at the time of observation, have attained an altitude equal to that of the scale, in order not to be too dependent on the law of the extinction of light which has been found. In doubtful nights, observations should be made only of such planets as have attained or exceeded that height. In very bright nights, however, and especially when the weather holds out the prospect of a continuance of clear nights, observations should be made repeatedly, and at as different altitudes as possible. The observations of the same star should not succeed each other too quickly. After the lapse of an hour, or an hour and a half, the observer will have already almost entirely forgotten the numbers of the earlier observation, and he may, therefore, institute a second observation, without having his mind occupied with the one preceding.

These are the methods and precautionary measures which the author suggests for the purpose of giving due efficacy to such ob-

servations. Their adaptation to the object of research will be easily seen; but the attentive observer will undoubtedly modify them to a considerable extent. They will attain the end which the author had in view, if they spare the observer a series of fruitless attempts.

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### *The Minor Planets.*

In conformity with the plan adopted at the Observatories of Washington and Altona, Professor Challis announces his intention of confining in future his observations of the minor planets with the Northumberland equatoreal to the following eight bodies: *Flora, Metis, Victoria, Themis, Proserpina, Bellona, Urania, Leucothea.*

Professor Challis purposes to observe the others occasionally, but to give these his particular and continued attention.

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Dr. Gould, editor of the *Astronomical Journal* (U.S.), states (No. 94, p. 176,) that Professor Brünnow has undertaken, in behalf of Ann Arbor Observatory, of which he is director, the regular observation of the following eight asteroids:—

*Flora, Victoria, Astrea, Metis, Proserpina, Calliope, Euphrosyne, Hebe.*

In order to facilitate and hasten this division of labour, Dr. Gould guarantees that four others shall also be regularly observed in the United States after the beginning of the year 1857; and he selects the following four as least likely to interfere with the preference of others:—

*Vesta, Iris, Eunomia, Amphitrite.*

Dr. Gould remarks that these will complete for the western continent its contingent of one half of the known members of the group. He could not, of course, have then been aware of the recent discovery of two new planets, nor of the proposal of Professor Challis.

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ERRATA.

Page 173, *Lætitia*, April 19, App. N.P.D., *for* 78° 49′ 47″·13, *read* 77° 49′ 45″·31.

— 185, line 13 from top, *for* zinc, *read* time.

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